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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/788,105	02/16/2001	Jay E. Uglow	LAM1P106D	2844

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EXAMINER	
PHAM, THANHHA S	
ART UNIT	**PAPER NUMBER**
2813	

DATE MAILED: 11/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/788,105	UGLOW ET AL.	
	Examiner	Art Unit	
	Thanhha Pham	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *21-24 and 26-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *41-44* is/are allowed.

6)☒ Claim(s) *21-24, 26-40, 45-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 February 2001* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/19/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to Applicant's Amendment dated 08/20/04.

Claim Objections

1. **Claims 43, 45-46 and 52-54 are objected to because of informalities. Appropriate corrections are required to clarify the scope of the claim**.

➢ With respect to claim 43, "wherein a thickness of the low dielectric constant layer of a carbon doped oxide is greater than a thickness of the inorganic dielectric layer of a fluorine doped oxide" should be changed to "wherein the second thickness of the low dielectric constant layer of the carbon doped oxide is greater than the first thickness of the inorganic dielectric layer of the fluorine doped oxide" (see claim 41 for details).

➢ With respect to claims 45 and 52, "a thickness of the inorganic dielectric layer" should be changed to "the first thickness of the inorganic dielectric layer" (see claim 41 for details).

➢ With respect to claims 46 and 53, "a thickness of the low dielectric constant layer" should be changed to "the second thickness of the low dielectric constant layer" (see claim 41 for details).

➢ With respect to claim 54, "wherein a thickness of the low dielectric constant layer of a carbon doped oxide is greater than a thickness of the inorganic dielectric layer of fluorine doped oxide" should changed to "wherein the low dielectric constant layer is a carbon doped oxide and the inorganic dielectric layer is a fluorine doped oxide, the

second thickness of the low dielectric constant layer of the carbon doped oxide is greater than the first thickness of the inorganic dielectric layer of the fluorine doped oxide"

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 45-46 and 52-53 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claimed limitations of "a thickness of the inorganic layer is about 10,000 angstroms" and "a thickness of the low dielectric constant layer is about 10,000 angstroms" are not supported by specification and figures.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 47-48 and 51 are rejected under 35 U.S.C. 102(e) as being anticipated by Smith et al.[US 6,255,233].

➢ With respect to claim 47, Smith et al., fig 3 and cols 1-7, discloses the claimed multi-layer dielectric disposed over a substrate comprising:

a barrier (150, col 4 lines 42-44 and abstract) disposed over the substrate (100);

an inorganic dielectric layer (160, col 4 lines 44-46) disposed over the barrier layer, the inorganic layer having a first thickness; and

a low dielectric constant layer (170, col 4 lines 46-50) disposed over the inorganic dielectric layer, the low dielectric constant layer having a second thickness and defining a metallization line layer (see figure 3);

wherein metallization lines (165) are formed in a first portion of the second thickness of low dielectric constant layer (170), and a via path (155) is configured to be defined in an entire portion of the first thickness of the inorganic dielectric layer (160) and in at least a portion of the second thickness of the low dielectric constant layer (170) [see col. 5 lines 1-20 for details].

➢ With respect to claim 48, Smith et al. (col 4 lines 44-46) discloses the barrier layer (170, silicon nitride) is one of a silicon nitride layer and a silicon carbide layer.

➢ With respect to claim 51, Smith et al. discloses the inorganic dielectric layer (160, graded silicon oxynitride) has different material properties than the low dielectric constant (170, SiOF).

4. Claims 47-49 are rejected under 35 U.S.C. 102(e) as being anticipated by Venkatesan et al. [US 6,326,301].

➢ With respect to claim 47, Venkatesan et al., fig 9 and cols 1-14, discloses the claimed multi-layer dielectric disposed over a substrate comprising:

a barrier (15, col 13 lines 9-11) disposed over the substrate;

an inorganic dielectric layer (18, undoped TEOS or fluorine doped TEOS, col. 13 lines 1-24, col. 6 lines 59-65 and col. 5 lines 56-59) disposed over the barrier layer, the inorganic layer having a first thickness; and

a low dielectric constant layer (22, col 13 lines 1-24, col 8 lines 31-32, col 5 lines 56-59) disposed over the inorganic dielectric layer, the low dielectric constant layer having a second thickness and defining a metallization line layer (see figure 9);

wherein metallization lines (165) are formed in a first portion of the second thickness of low dielectric constant layer (170), and a via path (155) is configured to be defined in an entire portion of the first thickness of the inorganic dielectric layer (160) and in at least a portion of the second thickness of the low dielectric constant layer (170) [see col. 5 lines 1-20 for details].

➢ With respect to claim 48, Venkatesan et al. (col 3 lines 9-11) discloses the barrier layer (15, silicon nitride) is one of a silicon nitride layer and a silicon carbide layer.

➢ With respect to claim 49,Venkatesan et al (col. 13 lines 1-24, col. 6 lines 59-65 and col. 5 lines 56-59) disclose the inorganic dielectric layer (18) is one of an un-doped TEOS oxide and a fluorine doped oxide.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 21-23 are rejected under 35 U.S.C. 103(a) as being being unpatentable over Wang et al [US 6,255,735] in view of Applicant's Admitted Prior Art (APA).

➢ With respect to claim 21, Wang et al , fig 11 and cols 1-8, discloses a multi-layer dielectric layer/structure over a substrate for dual damascene applications comprising:

a barrier layer (12, col 5 lines 28-31) disposed over the substrate (10);

an inorganic dielectric layer (14, col 5 lines 40-41) disposed over the barrier layer; and

a low dielectric constant layer (18, col 5 lines 51-67 and col 6 lines 1-11) disposed directly over and in directly contact with the inorganic dielectric layer (14);

wherein the low dielectric constant layer(18) is configured to receive metallization line trenches to define a metallization line layer and the inorganic dielectric layer is configured to receive vias during a dual damascene process.

Wang et al is silent about the inorganic dielectric layer having a dielectric constant of about 4. However, the claimed range of dielectric constant of about 4 is considered to involve routine optimize routine optimization while has been held to be within the level of ordinary skill in the art. The claim is prima facie obvious without

showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA 1980) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Moreover, APA (fig 1 and specification page 2) teaches using the inorganic dielectric layer (18a, undoped TEOS oxide) having the dielectric constant of about 4 (4.1) configured to receive vias during a dual damascene process. Therefore, it would have been obvious for those skilled in the art to modify the multi-layer dielectric layer of Wang by using the inorganic dielectric layer having the dielectric constant of about 4 as being claimed, per taught by APA, to define the via in the dual damascene application in a semiconductor device. Selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co., Inc. v. Interchemical Corp. , 325 U.S. 327, 65 USPQ 297 (1945) "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig - saw puzzle." 65 USPQ at 301.).

➢ With respect to claim 22, Wang et al (col 5 lines 26-31) discloses the barrier layer (12, silicon nitride) is one of a silicon nitride layer and a silicon carbide layer.

➢ With respect to claim 23, Wang et al (col 5 lines 40-41) discloses the inorganic dielectric layer (14, SiOF) is one of an undoped TEOS layer and fluorine doped oxide.

6. Claims 24 and 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al [US 6,255,735] in view of APA as applied to claim 23 above, and further in view of Usami [US 6,077,574].

➢ With respect to claim 24, Wang et al in view of APA substantially discloses the claimed multi-layer dielectric layer over a substrate for use in dual-damascene application except teaching the low dielectric constant layer being of a carbon doped oxide.

However, Usami teaches using the carbon-doped oxide layer would provide a better low constant dielectric layer with good resistance to moisture and heat.

Therefore, it would have been obvious for those skilled in the art to modify the multi-layer dielectric layer of Wang et al in view of APA by using the low constant dielectric layer of carbon doped oxide, as taught by Usami, to form the multi-layer dielectric layer with a good characteristics of low RC, good reistance to moisture and resistance to heat.

➢ With respect to claim 26, Wang et al (col 5 lines 51-67) discloses the inorganic dielectric layer (14) has different material properties than the low dielectric constant layer (18).

➢ With respect to claim 27-30, the claimed ranged thickness of the inorganic dielectric layer and the low dielectric layer are considered to involve routine experimentation while has been held to be within the level of ordinary skill in the art. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA 1980) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

7. Claims 31-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al [US 6,255,735] in view of APA and Usami [US 6,077,574].

➢ With respect to claim 31, Wang et al , fig 11 and cols 1-8, discloses a multi-layer inter-metal dielectric semiconductor structure comprising:

a barrier layer (12, col 5 lines 28-31) disposed over a metal interconnection region (10);

an inorganic dielectric layer (14, SiOF, col 5 lines 40-41) disposed over the barrier layer; and

a low dielectric constant layer (18, col 5 lines 51-67 and col 6 lines 1-11) disposed directly over and in directly contact with the inorganic dielectric layer (14);

wherein the low dielectric constant layer(18) is configured to receive metallization line trenches to define a metallization line layer and the inorganic dielectric layer is configured to receive vias during a dual damascene process.

Wang et al does not expressly teach:

a) the barrier layer being disposed over a based dielectric;

b) the inorganic dielectric layer being formed of an undoped TEOS oxide; and

c) the low dielectric constant layer being formed of a carbon doped oxide.

Regarding to **a),** APA (fig 1, specification pages 2-3) discloses a multi-layer inter-metal dielectric semiconductor structure using barrier (16a) disposed over the dielectric base (10) for forming interconnection between metallization line in dual damascene structure to an interconnect (12/14) in the dielectric base (10). Therefore, it would have been obvious for those skilled in the art to modify the dielectric structure for dual damascene application of Wang et al by using the dielectric base on which the barrier is disposed over as being claimed, per taught by APA, to provide interconnection between metallization line in dual damascene structrure to the interconnect in the dielectric base as a design of a semiconductor being needed.

Regarding to **b)**, undoped TEOS oxide is a known inorganic material in a multi-layer inter-metal dielectric semiconductor structure that is used to configure to receive

vias during a dual damascene process. See APA as an evidence that shows using the inorganic dielectric layer of the undoped TEOS oxide (18a, fig 1) to define vias in dual damascene application. Therefore, it would have been obvious for those skilled in the art to modify the multi-layer inter-metal dielectric semiconductor structure of Wang et al by using the undoped TEOS oxide as the known material, per taught by APA, for the inorganic dielectric layer to receive vias in dual damascene application. Selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co., Inc. v. Interchemical Corp. , 325 U.S. 327, 65 USPQ 297 (1945) "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig - saw puzzle." 65 USPQ at 301.).

Regarding to **c),** Usami teaches using the carbon-doped oxide layer would provide a better low constant dielectric layer with good resistance to moisture and heat. Therefore, it would have been obvious for those skilled in the art to modify the multi-layer inter-metal dielectric semiconductor structure of Wang et al in view of APA by using the low constant dielectric layer of carbon doped oxide, as taught by Usami, to form the multi-layer inter-metal dielectric semiconductor structure with a good characteristics of low RC, good resistance to moisture and resistance to heat.

➢ With respect to claim 36, Wang et al , fig 11 and cols 1-8, discloses a dielectric structure for dual damascene applications comprising:

a barrier layer (12, col 5 lines 28-31) disposed over a metal interconnection region (10);

an inorganic dielectric layer of a fluorine doped oxide (14, SiOF, col 5 lines 40-41) disposed over the barrier layer; and

a low dielectric constant layer (18, col 5 lines 51-67 and col 6 lines 1-11) disposed directly over and in directly contact with the inorganic dielectric layer (14);

wherein the low dielectric constant layer(18) is configured to receive metallization line trenches to define a metallization line layer and the inorganic dielectric layer is configured to receive vias during a dual damascene process.

Wang et al does not expressly teach:

a) the barrier layer being disposed over a based dielectric; and

b) the low dielectric constant layer being formed of a carbon doped oxide.

Regarding to **a),** APA (fig 1, specification pages 2-3) discloses a dielectric structure for dual damascene applications using barrier (16a) disposed over the dielectric base (10) for forming interconnection between metallization line in dual damascene structure to an interconnect (12/14) in the dielectric base (10). Therefore, it would have been obvious for those skilled in the art to modify the dielectric structure for dual damascene application of Wang et al by using the dielectric base on which the barrier is disposed over as being claimed, per taught by APA, to provide interconnection between metallization line in dual damascene structrure to the interconnect in the dielectric base as a design of a semiconductor being needed.

Regarding to **b),** Usami teaches using the carbon-doped oxide layer would provide a better low constant dielectric layer with good resistance to moisture and heat.

Therefore, it would have been obvious for those skilled in the art to modify the dielectric structure for dual damascene applications of Wang et al in view of APA by using the low constant dielectric layer of carbon doped oxide, as taught by Usami, to form the dielectric structure with a good characteristics of low RC, good resistance to moisture and resistance to heat in a semiconductor device.

➢ With respect to claims 32-35 and 37-40, the claimed ranged thickness of the inorganic dielectric layer and the low dielectric layer are considered to involve routine experimentation while has been held to be within the level of ordinary skill in the art. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA 1980) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

8. Claims 50 and 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al.[US 6,255,233] in view of Usami [US 6,077,574].

➢ With respect to claim 50, Smith et al substantially discloses the claimed multi-layer dielectric except teaching the low dielectric constant layer is a carbon-doped oxide.

However, Usami teaches using the carbon-doped oxide layer would provide a better low constant dielectric layer with good resistance to moisture and heat.

Therefore, it would have been obvious for those skilled in the art to modify the multi-layer dielectric layer of Smith et al by using the low constant dielectric layer of carbon doped oxide, as taught by Usami, to form the multi-layer dielectric layer with a good characteristics of low RC, good reistance to moisture and resistance to heat.

➢ With respect to claims 52-53, the claimed ranged thickness of the inorganic dielectric layer and the low dielectric layer are considered to involve routine experimentation while has been held to be within the level of ordinary skill in the art. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA 1980) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

9. Claims 50-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatesan et al. [US 6,326,301] in view of Usami [6,077,574].

➢ With respect to claims 50 and 54, Venkatesan et al substantially discloses the claimed multi-layer dielectric including: the inorganic layer (18) is a fluorine doped oxide; and the second thickness of the low dielectric constant layer is greater than the first thickness of the inorganic layer of fluorine doped oxide ***[claim 54].***

Venkatesan et al does expressly teach the low dielectric constant is a carbon doped oxide ***[claims 50 and 54].***

However, Usami teaches using the carbon-doped oxide layer would provide a better low constant dielectric layer with good resistance to moisture and heat.

Therefore, it would have been obvious for those skilled in the art to modify the multi-layer dielectric layer of Venkatesan et al by using the low constant dielectric layer of carbon doped oxide, as taught by Usami, to form the multi-layer dielectric layer with a good characteristics of low RC, good reistance to moisture and resistance to heat.

➢ With respect to claim 51, combining the teaching of Usami by using the carbon doped oxide for the low dielectric layer (20) of multi-layer dielectric of Venkatesan et al, those skilled in the art would recognize that the inorganic dielectric layer (undoped TEOS or fluorine doped oxide) has different material properties than the low dielectric constant layer (carbon doped oxide).

➢ With respect to claim 52 and 53, the claimed ranged thickness of the inorganic dielectric layer and the low dielectric layer are considered to involve routine experimentation while has been held to be within the level of ordinary skill in the art.

These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA 1980) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Response to Arguments

10. Applicant's arguments filed 08/20/04 have been fully considered but they are not persuasive.

In Applicant's argument on pages 14-16, Applicant argues that claims 21-40 can not be obvious over Wang et al in view Applicant's Admitted Prior Art because:

a) the k value of about 4 to specifically claim the inorganic dielectric layer is not a low k dielectric layer and the claimed k value of about 4 can not be considered to involve routine optimization.

b) the teaching of APA can not be combined to Wang structure because damascene structure of APA having two oxide layers separated by a trench stopping layer.

Regarding to **a)**, the argument is not persuasive since the application fails to show the claimed range of k value achieves unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA 1980) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious). In addition, the k value of about 4 to specifically claim the inorganic dielectric layer is still a low k dielectric layer (see Ahn et al., col 5 lines 18-22 and the table in col 5, that shows *low-k dielectric materials* having a dielectric constant of *less than or equal 4.5*).

Regarding to **b)**, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this situation, since using inorganic dielectric layer with a dielectric constant of about 4 has been known in the art to define vias in dual damascene application (APA is one of examples), selection of a known material based on its suitability for its intended use supported a prima facie obviousness

determination in Sinclair & Carroll Co., Inc. v. Interchemical Corp. , 325 U.S. 327, 65 USPQ 297 (1945) "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig - saw puzzle." 65 USPQ at 301.). In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, in the knowledge generally available to those skilled in the art, the inorganic dielectric material with the dielectric constant of about 4 is a conventional dielectric material used to define vias in dual damascene applications.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thanhha Pham

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